

4 *Social Organization of the Papago Indians*

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137 stream beds the bean bearing mesquite and palo verde stretch their roots down to underground water. On the plain grows the creosote bush and sometimes nothing else.

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132 This is one of the hottest and driest areas in the United States, the annual rainfall in the interior being about five inches.<sup>1</sup> Yet those five inches rendered subsistence possible for the Desert People. They are concentrated in the summer months of July and August when the daily cloudburst produces a temporary flood which may cover the flat plain to a depth of six inches for a square mile. In a day or two there sprout the seeds of annuals which may have remained inactive for several seasons, awaiting sufficient moisture. The succulent cacti swell, storing water for the dry months. The deciduous trees put out tiny leaves, exposing to the glare as little green as possible.

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221 For two months while the desert bloomed, the Papago picked and stored every root, stalk, leaf and fruit that it produced. Where the flood water had softened the soil, they planted small gardens which, begun in mid-July, had just time to mature before frost. All the harvest was dehydrated in the blazing desert sun and stored to furnish food in the dry months. Then the rain ceased; the rain reservoirs which had supplied drinking water for the valley dwellers dried up; life was impossible unless the population moved to the foothills where there were springs.

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[657] Until very recently, when the United States government has dug wells in the valleys, this was the life of the Papago. It precluded their having permanent houses, either for dwellings or for ceremonies. It prevented a centralized form of organization such as has been suggested for the Pima, both on the Gila and the San Pedro. But it kept the Papago unmolested until long after these others had disappeared or had assimilated White ways.

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174 Yet the Desert People, harassed by Nature as they were, found opportunity to practise all the arts described for the more fortunate Pima,<sup>2</sup> with only minor differences, due to materials. We may picture them, up to a few generations ago, living in round, semi-subterranean houses, often earth covered. They dressed in skirts and breechcloths of buckskin and, less often, cotton and wore sandals when they had any footgear at all. Their pottery was of coarse red clay, shaped by paddle and anvil with, only rarely, a decorated jar for offerings and seed storage. The bulk of their utensils was of basketry: plaited, coiled or netted in the intricate technique known as coil without foundation. These are old arts in

<sup>1</sup> Bryan, pp. 29-30.

<sup>2</sup> Russell, pp. 68-181. Castetter and Underhill, pp. 48-63.

## THE DESERT PEOPLE

576 queries about their personal affairs seem to them extremely bad taste. The Papago like privacy and respect the same desire for it in others.

157 Despite their quiet and controlled behavior, there is nothing somber or morose about the Desert People nor do they lack interest in what goes on  
521 around them. They are extremely observant and curious about details. With their friends they gossip constantly, but to be vindictive or to show off is not regarded with approval.

609 Though the reserve with which Papago greet a white stranger is often called  
522 "stolid" by people who do not know them, facial expressions are pleasant. Among themselves they laugh at the endless joking that goes on among family members, over a comic incident, a child's improper behavior, a misstatement, or their own embarrassment. They love to sing, and, in any Papago group, smiles and laughter are constant accents to conversation.

431 Gifts serve as acknowledgment among the Desert People for their language has no phrase for "thank you"; too, they give because they like giving, and the person who does not is thought to be not quite Papago.

## THE DESERT

133 It is no wonder that the Papago were not pushed off their land as were many other Indians. This area is one of the hottest and driest in the country, a land in which, with experience and hard work, a family can make a living; but it offers little in the way of surplus.

The Papago country, often referred to by its Spanish name of Papagueria, is a part of what natural scientists call the Lower Sonoran Desert, an area extending north and east to the Mongollon Rim in Arizona, westward into southeastern California, and southward along the western coast of Sonora and Sinaloa in Mexico. It is characterized by a basin and range topography, extreme drought and torrential rainfall, and great changes in daily and seasonal temperatures. A series of small ranges of rugged mountains run roughly northwest to southeast, with wide alluvial valleys marked by networks of washes or arroyos.<sup>4</sup> Elevation of valley floors varies from 1,400 to 2,600 feet, but the mountains on the whole are not high enough to affect rainfall except for the Baboquivaris on the eastern edge, where the tallest peak reaches 7,740 feet and seems to keep all the surrounding desert under its eye.

132 Rainfall in Papagueria is not only scarce but unpredictable. Rains come in the winter months and again from July through September. The gentle winter rains fall steadily over the whole area, sometimes for several days at a time,

4. A wash or arroyo is a stream channel which carries water only after the rains. Water rushing down the wash rapidly covers adjacent lands in what are known as flash floods.

## PEOPLE ON THE DESERT

but the summer storms come suddenly, the clouds pouring out water and then disappearing as quickly as they came. Rainfall varies greatly on different parts of the Reservation. In the southeastern districts where the mountains are highest, annual precipitation reaches an average of 18 inches in the mountains and about 13 inches in the valleys. Most of the permanent springs and the few small streams that flow for nine months in wet years are located in the foothills of this area. From the center of the Reservation westward, rainfall decreases progressively, averaging only 5 inches in Gu Vo District. Averages give no realistic picture, however, for years of good rainfall are often followed by years in which the washes do not flow at all. The year 1943, when the field work for this study was done, was one of extreme drought, perhaps the worst in history.

Temperature also fluctuates greatly. Winters are mild, with many sunny days, but sometimes the winds are raw and cold, and at night the thermometer may fall to 15° Fahrenheit. Sometimes snow falls on the higher mountains and may remain several days. The summer, from May through September, is extremely hot, with daytime temperatures usually exceeding 100° and often soaring to 120°. Daily range of temperature is wide; the average daily maximum and minimum are 82.5° and 51.1°—an average daily change of 31.4°.

Soils on the Reservation are generally of very good quality; lack of water is the prime factor limiting production. Hence the more arid western districts have a much lower proportion of farm lands and lower range carrying capacity than the central and eastern districts.

Like rainfall, vegetation varies with elevation. On the valley floors are miles and miles of cholla cactus and almost useless creosote bush,<sup>5</sup> and along the washes the sturdy and useful mesquite thrives. In the eastern districts mesquite is the characteristic growth; in the western areas the creosote bush, and in some alkaline regions the saltbush, are the most common plants. Even the mesquite areas are not so useful for range lands as they once were. Until about 1900, these areas were largely covered with perennial bunch grasses which provided good forage and helped to retain the topsoil. With increasing numbers of livestock, these grasses disappeared and the common grasses now are annuals which for forage must be supplemented by mesquite, cholla, saltbush, bur sage, and paloverde. Loss of the perennial grasses has also permitted considerable soil erosion, although there is little gullying because the valleys are flat.

Where the valleys rise to the foothills, and continuing over most of the low ranges, paloverde, ironwood, and giant saguaro cactus are the main stands.

5. The creosote bush does furnish lac, a gum with which the Papago make pottery, and it has some medicinal uses. But animals will eat it only in an extremity.

## CHAPTER II

## LAND, CLIMATE AND VEGETATION

Pe Most of the Piman territory lies within the area known  
 Pe as the Sonoran Desert, described by Shreve, as well as within  
 193 the Sonoran Biotic Province, delimited by Dice. The vegeta-  
 tion of the Mexican portion of the area has been discussed by  
 Brand.<sup>1</sup> That part of Pimería Alta falling within the scope  
 of our field studies on the Pima-Papago lies in southern Ari-  
 zona, and is nearly coincident with the southern part of the  
 physiographic division designated as the Basin and Range  
 Province. It is an arid country with well-eroded fault block  
 mountains rising between broad, waste-filled, intermont  
 depressions. In the lower portions of these depressions, far-  
 thest from the mountains, sand and gravel washes traverse the  
 flat, silt lands, which have a surface veneer of coarser material.  
 As the mountains are approached, the terrain rises in long,  
 gentle, alluvial slopes of sandy soil which still nearer the  
 mountains become gravelly or stony, until rock floor finally  
 is exposed in the washes. The general axis of surface fea-  
 tures is northwest to southeast. These intermont plains rise  
 gradually from an elevation of several hundred feet in the  
 west to more than 2,500 feet in the east and northeast, and  
 from them rise abruptly the low, narrow mountain ridges  
 which are most massive and elevated in the east, culminating  
 with the Baboquivari Range and its peak with an elevation  
 of 7,741 feet.<sup>2</sup>

Pe Climatically the chief features of our area are the low and  
 Pe erratic precipitation, averaging about ten inches on the  
 192 inhabited plains and associated with a very high rate of  
 evaporation; the high summer temperatures often well above

<sup>1</sup> Shreve, *Plant Life of the Sonoran Desert*; Dice, *The Sonoran Biotic Province*; Brand, *Notes to Accompany a Vegetation Map of Northwest Mexico*.

<sup>2</sup> Hoover, *The Indian Country of Southern Arizona*, pp. 39-45.

100° F.; mild winters with temperatures little below freezing <sup>Pi</sup> except in the higher levels; a pronounced daily temperature <sup>Pa</sup> range averaging from 30° to 40°; an annual high mean of 320 <sup>132</sup> to 350 days of sunshine; and a long growing season.

#### THE GILA BASIN AND THE PIMANS

Unlike Papago agriculture, that of the other Pimans <sup>Pi</sup> depended upon irrigation water obtained from several rivers. <sup>312</sup> Chief of these, the Gila, rises in the mountainous country of <sup>133</sup> western New Mexico, changes its character markedly westward from the Buttes, east of Florence, and emerges from the mountain region of eastern Arizona. Here it enters upon the detrital plains of the Basin Range Province, and, throughout its westward course to the Colorado, except at a few places, winds over deep deposits of alluvium in broad valleys between short mountain ranges. Over its lower course it has cut a very shallow valley. The Gila is an interrupted river, that is, having a permanent flow over short distances of its entire course throughout the year, and along these stretches of perennial water there have been more or less permanent settlement and irrigation. However, its volume steadily decreases and in the lower 150 to 200 miles of its course there are long stretches of its bed which are covered with water only after heavy rains.<sup>3</sup> The precipitation in the middle <sup>Pi</sup> Gila area, covering the region of the Gila River Indian Res- <sup>132</sup> ervation, roughly is between ten and thirteen inches. Precipitation figures for stations within and adjacent to our area are: Casa Grande, 19.39 in.; Florence, 9.99 in.; Phoenix, 7.90 in.; Gila Bend, 5.95 in.; and Sacaton, 10 in. Farther to the east and north in the mountains precipitation ranges from fifteen to twenty inches or more. At Sacaton the highest rainfall occurs in July and August, the lowest in April, May and June. Here the temperature during the coldest weather seldom goes below 20° F. and the summer temperatures have been as high as 117°. The mean daily range between day and

<sup>3</sup> Hoover, *op. cit.*, pp. 39-48; Ross, *The Lower Gila Region*, pp. 62-7.

312<sup>P</sup> dently cultivated in places; none of these upper terrace lands has been utilized by the modern Pima. Since the subjugation of the Apache, the Pima have been extending their settlements gradually over the tillable lands of the lower terrace, although at the middle of the last century they were almost entirely concentrated in villages on the south side of the river from about two and one-half miles below Sacaton westward nearly to Pima Butte.<sup>11</sup> Irrigated lands in the vicinity of Sacaton have always been located chiefly on the south side of the Gila since the north side has less bottom-land and irrigation is more difficult. A detailed history of irrigation on the Gila River Indian Reservation together with the history of the various canals and ditches is given by Southworth.<sup>12</sup>

## THE DESERT AND THE PAPAGO

133<sup>Pa</sup> Our Papago land as delimited is an arid, forbidding, isolated desert region in which life was conditioned largely by the scarcity of water. Long ago Font tersely aired his opinion of the area thus: "In short, in all this land of Papagueria which we passed through, I did not see a single thing worthy of praise."<sup>13</sup> Formerly it was thinly populated throughout by Papagos who at present live almost wholly in its eastern and central portions. In 1925 Bryan<sup>14</sup> observed that the spacious western portion of the region, which has a rainfall of less than five inches per year and contains extremely few permanent watering places, was inhabited by a solitary white man. However, various factors have contributed toward making this western territory more accessible and habitable within recent years.

132<sup>Pa</sup> The climate of our Papago region is characterized by high temperature and low precipitation. Summer temperatures

<sup>11</sup> Hoover, *op. cit.*, pp. 46-8; Haury, in Gladwin *et al.*, *Excavations at Snaketown*, I, 50-8; Bartlett, *Narrative*, II, 233.

<sup>12</sup> Southworth, *op. cit.*

<sup>13</sup> Bolton, *Annals*, IV, 23.

<sup>14</sup> Bryan, *op. cit.*, xvii.

often exceed 100° F., and at times approach 120°. The growing season is long, for example, ranging from 249 days at Tucson to 331 at Ajo. At Yuma, killing frosts very rarely occur except in the lower parts of the valley, while farther east a few killing frosts occur each winter. Both daily and seasonal range in temperature is very great.<sup>15</sup>

The outstanding climatic characteristic of the Papago country is its very low precipitation; in general this increases with altitude, although the smaller mountains seem to have little effect on storms, and their vegetation does not indicate any large increase in effective rainfall over that of the adjacent plains. This is especially true of the area west of the Growler Mountains. A most extreme desert condition is found along the lower Colorado River, an area that may receive from none to three or more inches of rainfall per year, and even this may fall in a single storm. The western portion of the area is thus a veritable desert, but to the east, with higher elevation, the vegetation is inclined to be steppe-like. Distance from the Gulf of California is also a governing factor in the precipitation in this area, the amount increasing with distance. With respect to the mean annual precipitation, Bryan distinguished three divisions in the Papago country. West of the Growler Mountains it ranges from three and one-half to five inches (3.33 in. at Yuma); between the Growler and Baboquivari mountains from five to ten inches; east of the Baboquivari Mountains it is more than ten inches. The belt of low precipitation, less than five inches, extends up the Gila Valley to Gila Bend and in the interior of our Papago area to the Growler Mountains.<sup>16</sup> Mallery's studies show that, dividing his rainfall stations in the Sonoran Desert into four groups on the basis of elevation, those below one thousand feet had an annual average of 4.19 in.; those between one thousand and two thousand feet, 8.10 in.; those between two thousand and three thousand feet, 11.03 in.; and those above

<sup>15</sup> Smith, *op. cit.*; Bryan, *op. cit.*, pp. 29-31, 79-80.

<sup>16</sup> Bryan, *op. cit.*

- 32 Three thousand feet, 25 in. The following table lists precipitation figures as presented by Mallery and by Smith:<sup>17</sup>

|                                          | Altitude | Precipitation |
|------------------------------------------|----------|---------------|
| Ajo .....                                | 1770     | 9.88          |
| Baboquivari .....                        | 3675     | 17.98         |
| Sierrita Mta. ....                       | 4100     | 16.45         |
| Avra Valley .....                        | 3400     | 16.11         |
| Soldier Camp (Santa Catalina Mta.) ....  | 7675     | 33.45         |
| Pima Canyon .....                        | 2600     | 11.00         |
| Desert Laboratory Grounds (S. W. Corner) | 2400     | 12.39         |
| Tucson .....                             | 2387     | 10.96         |
| Sells .....                              | 2500     | 11.62         |
| 23 Mile Hill .....                       | 2350     | 11.26         |
| Growler Pass .....                       | 2250     | 8.27          |
| Agua Dulce .....                         | 1140     | 6.98          |
| Pinacate Plateau .....                   | 910      | 4.25          |
| Tule Tank .....                          | 1115     | 4.13          |
| Tinajas Altas .....                      | 1050     | 5.47          |
| Lechuguilla Desert .....                 | 715      | 4.22          |

Distribution of rainfall in the Sonoran Desert, within which our Papago area falls, is usually concentrated in two distinct periods of the year—the winter and summer seasons.<sup>18</sup> Turnage and Mallery have treated the months from May to October as the summer rainy season; November to April as the winter season. They find that there is a progressive increase of summer over winter rainfall from northwest to southeast in the Sonoran Desert and adjacent territory; also that the northwestern half of the region receives more winter than summer rain. Sykes and Smith point out that for Arizona approximately 35 per cent of the total annual precipitation falls during December, January, February and March, and 45 per cent during July, August and September. The summer rains are apt to be spontaneous and of short duration, while those in winter as a rule are gentle and may continue for several days. However, the winter-summer ratio varies considerably over different parts of the state. Mallery shows that at most of his stations the summer rains were

<sup>17</sup> Mallery, *Rainfall Records for the Sonoran Desert*; Smith, *op. cit.*

<sup>18</sup> Turnage and Mallery, *op. cit.*; Smith, *op. cit.*; Mallery, *op. cit.*; Sykes, *Rainfall Investigations*, p. 229.

5: Castetter & Bell N-5 (1938-1940) 1942

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Pima NU29

LAND, CLIMATE AND VEGETATION

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greater in amount than the winter rains, but as one went westward they tended to become more nearly equal until, in extreme southwestern Arizona, the winter rains were heavier. He refers to unpublished data of Sykes, who found that analyses of the 118 stations in Arizona show that in most sections the winter rains are greater, and that only in southeastern and southcentral Arizona and two relatively small areas in eastcentral and northeastern Arizona do the summer rains exceed winter precipitation.

Data on the total annual rainfall at any given position constitute a basic starting point for a consideration of the climate of that region. However, knowledge of the distribution, involving fluctuation in rate and amount, is more important from the standpoint of natural vegetation and agriculture than is the yearly total. The wide variation in amount and temporal distribution of rainfall, with their periods of drought and series of dry years, render the Papago country a precarious place to pursue agriculture.

VEGETATION<sup>12</sup>

In considering the natural vegetation of the American portion of the Pimería Alta it is desirable to begin with the watercourses that drain the southern desert; one may say that wherever deep alluvial soils have been built up and subterranean water is available, dense forests of mesquite formerly were, and to some extent still are, to be found. Such dense forests occurred on the bottomlands of the San Pedro, the flood plain of the Santa Cruz, lower and middle Gila roughly from within a few miles of Yuma as far east as the point where the Southern Pacific Railroad crosses the Gila northwest of Vahlki, and the lower Colorado. Remnants of these original stands still exist along the San Pedro, notably be-

<sup>12</sup> This account of the vegetation of the area under consideration is based upon Nichol, *The Natural Vegetation of Arizona*; Bryan, *op. cit.*; information secured by correspondence with Dr. Forrest Shreve of the Carnegie Desert Laboratory at Tucson; and our own field observations.

Pi' relation of the sun to the gap of the Sierra Estrella, the chief  
 Pa' purpose being to determine the latest period at which it was  
 241 possible to plant crops and have them mature before frost.  
 205 Chico Bailey said his grandfather relied upon the position of  
 the rising sun with reference to a certain point on Babo-  
 quivari Mountain to determine when it was too late to plant;  
 also that the Papagos at Pisinemo used a similar spot in the  
 Ajo Mountains for the same purpose.

Pi' Tribal Papago traditions were passed on by word of  
 Pa' mouth from official narrators to the youths. While these tales  
 538 might be told at any time upon request, particularly in winter  
 211 months, the creation myth was always formally and officially  
 related during the sacred four-day solstice period. Pima and  
 Papago annals, in reality records of important events, were  
 kept on a stick variously notched or carved to designate spe-  
 cial happenings.<sup>7</sup>

## PLANTING

### *Time and Number of Plantings*

- Pi' Wherever any group of Pimans anciently pursued agri-  
 ● Pa' culture based upon irrigation from more or less permanently  
 241 running streams or springs, planting was begun as soon as  
 ● 132 possible after danger of frost had passed, contingent upon an  
 available supply of water at such time. But among all those  
 Pimans who were dependent upon flood water from the  
 washes the time of the single planting was governed entirely  
 by the occurrence of summer rains, which usually began at  
 any time from late June to mid-July. Aboriginally, groups  
 having a rather constant supply of running water usually  
 made two plantings, the first when danger of frost was past  
 and the ground warm enough for seed germination, the sec-  
 ond sometime after sahuaro harvest, depending upon the  
 availability of water for irrigation, but rarely any later than  
 mid-August because of danger from early frosts. Thus, in

<sup>7</sup> Ibid., pp. 125-26; Underhill, *A Papago Calendar Record*; Russell, *op. cit.*, pp. 31-66.

5: Castetter & Bell N-5 (1938-1940) 1942

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addition to being limited by water supply, the time of the first planting was governed by late, the second by early, the frosts, these dates varying somewhat in different parts of the Piman area. In this connection, Smith<sup>241</sup> tells us that a correlation of altitude and length of growing season, with corrections for latitude, shows that, on the average, an increase of forty-five feet in altitude decreases the average length of the growing season by one day, an increase of one thousand feet thus shortening the season about three weeks. At Sacaton, on the Gila River Reservation, with an elevation of 1,280 feet, a twenty-one-year record showed the average date of the last killing frost in spring as March 3, the latest known date April 22; the average date of first killing frost in autumn, November 15, the earliest date of killing frost, October 28. This gives the mean length of growing season as about 263 days.<sup>242</sup>

All Piman groups whose agriculture anciently depended upon flood water from washes made but a single planting, the time of which was in no way governed by a frost-free date, since planting had to await the beginning of summer rains, from late June to mid-July, and thus corresponding with the end of sahuaro harvest. Such was the general Papago situation, since with very few exceptions, notably San Marcelo de Sonoita and Quitobac, their agriculture was pursued without irrigation from running streams and was therefore styled *de temporal* or "thunderstorm." A number of reports of Indian agents at San Xavier in the closing years of the last, and beginning of the present, century refer to the "so-called second crop" of these Indians. By this was meant that the wheat and barley, planted any time from November to January, was designated as the first crop; the maize, beans and pumpkins planted after the first summer rains, the second. But anciently only a single crop was planted at San Xavier. Although this village had running springs, the Santa Cruz River, upon

<sup>241</sup> Smith, *The Climate of Arizona*, pp. 380, 385.

<sup>242</sup> *Ibid.*; King, *Crop Tests at the Cooperative Testing Station*, p. 9.

## NEW TRAILS IN MEXICO

- [133] University of Arizona, in July, 1898, succeeded in ascending it, and by an aneroid barometer the height was found to be 7,850 feet above sea-level. The ascent was made from the west side, and, to quote his own words, "the extreme top of the mountain is a gentle oval about a hundred yards across. From this lofty vantage the eye sweeps over about three hundred miles of a terrific and almost untouched wilderness of rocks." There is a small pool on top which holds a few gallons of water after rain. In rainy weather, water drips down on the north side five hundred feet below the top, where several small pools were seen.

It is perhaps at the latter place that the pond is found [778] which is called by the Indians Viikan Shōotak, "Lasting Water" (*shōotak*, water), and which in the belief of the Indians was left by the sea after the deluge. At the time of the making of sahuaro wine for their great feasts of the summer, people go up there to get some of this water, after having first sung to it, to use in the wine making.

- [132] On Friday, June 25, we approached from the west the large rancheria called Fresnal, situated among the foot-hills below the peak of Baboquivari, which looked more magnificent from that point of view than from any other I have seen. The air was very pure and transparent, and I took a photograph of the peak at half-past five in the afternoon. Just as I cast a glance backward, before making a second exposure, I was astonished to see that the region toward the west and south was hazy, and I had scarcely time to make the exposure when the haze and a light wind, moist from the sea, arrived. A

## A LARGE RANCHERIA

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- 132 few minutes later the Baboquivari Range, at a distance of ten miles, was enveloped in a light fog. The change was not only seen but felt, the temperature fell, and the moisture of the air was very perceptible. As the wagon was heavy and the road led uphill, it grew late before our arrival, but the moon was half full, so we found our way easily in the now quite chilly evening. The spell of extremely dry air was broken and the season of rain showers approaching.

756 We made our camp next to a big mezquite tree on a slope among the ranches. The weird singing of a medicine-man sounded through the greater part of the night. Few are those Papagoes who have lost faith in their own doctors, and even the so-called policemen turn to them for relief if anything ails them.

361 Fresnal consists in reality of three rancherias, and we  
132 found ourselves in the middle one. They are pleasantly  
[137] situated among the foot-hills and look like villages. The name is derived from some ash trees that grow in the arroyo, the native name having the same meaning. Naturally, the rainfall is greater here in the mountains than on the llano and, according to local accounts, the arroyos at times run a whole day. Occasionally the water is six feet deep. The Indians say that the arroyos here carry water to the Sonoita River.

231 The Indians of Fresnal are well-to-do; three or four of the men are reputed to own as many as two hundred head of cattle and fifty horses each. Wagons and good horses were seen, and there were plenty of chickens about. Men and women, especially the latter, looked in

## AN ANCIENT FORTIFICATION

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morrow in the afternoon, and some will not return until<sup>231</sup> the third day." It was the hottest time of the year—the<sup>[132]</sup> end of June. ●

Three miles from here, just about where the llano<sup>361</sup> begins, there rises a small hill, four hundred feet high,<sup>192</sup> called La Ventana. On the west side it has been fortified by the ancient people with half a dozen or more stone walls of the usual description. The walls are perhaps more massive than is the case at most places. The fortifications had a remarkably fresh look about them, as if they had been in recent use. On top, where blocks had been broken off to form walls and parapets, the underlying rock still looked as untouched by the hand of time as if the work had been done within two years. Circular or square enclosures of the usual type are seen on a natural terrace near the top. A fairly well constructed track leads up to the summit where a rattlesnake was resting in a cool cavity. A ground-squirrel was noticed, and on the hill-side two camping places of the gray fox were observed, each under a small bush, the ground having been worn quite smooth.

The vast plain is impressive from the top; the ranges,<sup>133</sup> enveloped in a blue haze, appeared small, Comobabi and Quijotoa in the north-west being the nearest. To the right of the Comobabi Range, in one place only, toward north north-west, the view was unobstructed as far as the eye could see. In the south-west the small hills near Sonoita were visible. The many arroyos on the west side of the Baboquivari Range are worthy of note; they are short, quite deep, and impossible for wagons to cross

## THE REAL INDIAN

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ing a large sleeping mat, plaited from zotol leaves in the 513  
usual manner, which I had also bought. Another, a  
smaller daughter, sat near by, while on the roof the third 124  
child, a boy of eight summers, was romping in a short  
shirt, throwing stones and looking picturesque against  
the blue sky and the mountains of Baboquivari. One's  
photographic propensities are sorely tried under such  
tempting circumstances. As we approached, the boy  
descended. Pablo, at my bidding, engaged the family  
in conversation and I tried to avoid observation while  
taking snapshots, for, if seen, that would have put a  
speedy end to the friendship so happily begun.

This was an attractive family that carried one's  
thoughts back to the Indian of long ago. The mother  
seemed the incarnation of sterling qualities, well mean-  
ing, intelligent, and active. She had quite an eye to  
business, but she asked fair prices. She looked about  
fifty, the picture of health, and had borne thirteen chil-  
dren, nine of whom were alive; many of these were  
full-grown and the youngest was six years old. Her  
husband, who was as friendly as his wife, or even more [55]  
so, had a peculiar name, Piukváotam, "He cannot be  
eaten" (because bitter to the taste). This probably ex-  
presses some characteristic of antipathy which I failed  
to discover, the Indians being extremely critical in their  
application of names.

It was the 10th of July; for several days the maxi- 132 ●  
mum temperature had remained at about 100° F. A  
moist wind, somewhat cooler, had been blowing too  
gently for real comfort, but that day about sunset the

- 132 air currents changed and became dry. In the evening the temperature felt just right, about 85° F., and the air, at an elevation of four thousand feet, had the superb quality of the desert.

ooo I had selected my camp a couple of hundred yards from the house, on a sandy, level ground among small mezquite trees and choyas. The sandy surface was as clean as if man had never walked over it; the Indians on their way to and from the distant well at the foot of the mountains all followed the same track, and there were no waste paper and tin cans strewn about to impair the full enjoyment of nature, as would have been the case near civilized man's abodes.

The attractive camp, the nice family we had met, the addition to my collections, the peace and quiet of the place made me feel happy as I stretched myself on my cot under the starlit sky, which seemed so blue and cool and near. A soft breeze from the west fanned me to sleep, while a mocking-bird kept on singing its most delightful notes in the dark night. Ye dwellers in cities know not what it is to feel your freedom!

- Next morning, shortly after sunrise, I strolled over to the house to see what my Indian friends were doing.
- 285 The mother was busy at work repairing the burden basket she had sold me. She was just finishing a new band for the back, which is plaited in the same manner as the sleeping mat and from the same material. Some Indians
- 241 rode up offering for sale a most interesting wooden object that resembled a broadsword, and which may be termed a hoe, made of the heavy iron-wood and accord-

132 I had taken my notes in a temperature of 107° F. in the shade of the jacal; at dawn that day the temperature had been 74° F. and I actually awoke from feeling cold. During the previous five days the maximum temperature had been above 100° F., and the heat still continued as high for three days more. No clouds had appeared for several evenings and the rains were delayed. It certainly felt warm as we travelled along on our return journey to San Pedro. No shade, as that word is understood in other climes, is found anywhere; the palo verde is seldom very serviceable for this purpose, and the best tree for shade is the mezquite, but on such days as these the fierce rays of the sun easily penetrate its somewhat scanty foliage, even the ground underneath the tree becoming heated. It was difficult to make the air circulate under our wagon cover, and we found ourselves in a heat as great as that of a Turkish bath. Still it is good policy to make the most of every favoring circumstance, so we always stopped for lunch near some mezquite tree, built a fire by which we made coffee, and had some canned goods and puffed wheat with evaporated milk to eat. The coffee especially, when made well, was very acceptable. After that we continued our journey greatly refreshed and actually cooler. My dog, however, did not know what to do with himself, refusing steadfastly to eat during the day; his favorite place was in the wagon, under the seat, on top of a box.

132 On July 15 the oppressive heat was lessened toward evening by a violent storm from the south-east, which darkened the atmosphere first with dust, then an hour

## A LARGE SUMMER RANCHERIA

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later with welcome black clouds which poured down considerable rain. The storm passed from Indian Oasis over Tucson, where, as I later learned, it damaged the roof of the new hotel. Some more rain the following evening and night made the outlook bright for continued travel. We were soon on the road again westward bound for Chief Alvina's sahuaro camp. After the somewhat vague indication as to its location being near the southern part of the Quijotoa Range, we had been left to our own instincts of orientation to find it.

On arriving at the so-called "Pump-house," near the Quijotoa Range, I made a détour of thirteen miles southward to the great summer rancheria Kuóitak (Big Field), in order to make sure that the recent showers had not already induced the chief to leave his sahuaro harvest for agricultural pursuits. It was surprising to find such a large cultivated area in the wilderness. It was over two miles long, from east to west, and a half mile wide, consisting, of course, of many small adjoining farms, all fenced in by loosely made mezquite fences. The late showers had certainly been effectual in bringing about changes. Pools of water enlivened the landscape here and there, and even some grass had begun to appear, scarcely forty-eight hours after the rain. Birds were singing in a lively manner, and there was spring in the air, but evidently the Indians did not consider the rain of sufficient quantity to justify them in beginning their ploughing. In July or August, as soon as they are assured of the soil being well soaked, they immediately repair to their summer rancherias. So far, only one

our family had arrived, so we continued our journey toward the southern end of the Quijotoa Range.

136 In the evening mosquitoes and other insects gathered around the lantern and small brown beetles crawled inside of my trousers or through my hair, reminding me of tropical climates. Next morning, before starting, I had a refreshing bath in a small water-hole, while a butcher-bird (*lanius*) in a near-by bush sang with all his might, apparently enjoying the changed conditions as much as myself. This bird was often seen in the desert, often far from water. Although the thermometer registered as high as 92° F. in the warmest part of the day, still the atmosphere, refreshed by the storms, felt remarkably cool, and the weather was cloudy.

133 The southern part of the somewhat extensive Quijotoa Range, separated from the rest, is called by the Papago, Kihotóak (*kíbo*, burden basket; *tóak*, mountain), said to be derived from its shape. The Spanish name of the whole range is a corruption of this native name. I was glad to find Chief Alvina in his camp, which was in close proximity to great forests of sahuaro on the slopes along the eastern base of the mountains. [574] He brought me as a welcome some pitahaya fruit which tasted remarkably well. All the rest of the fruit gatherers had already left, for the sahuaro season was over, though [37] there were still to be found pitahayas, the other savory cactus fruit of the region. There was no pasture; our horses fed on rolled oats, besides relishing the leaves of the palo fierro (iron-wood) tree.

The chief was perfectly willing to be interviewed for

## DRENCHED IN THE DESERT

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hours. He thought the number of the Papagoes was decreasing. Few old men were seen any more. The food which is gradually supplanting their native dishes is injurious to the health of the Papago. Children were no longer obedient. The young men nowadays are seized with restlessness and want to leave for other parts of the country; nobody takes care of them, and they die early, he complained. We took a walk together, and he pointed out to me the ripe nuts of the *jójoba*, a bush of common occurrence in that country. They are eaten by the Indians and have rather a pleasant flavor. As they contain a great deal of oil, they might compete with peanuts in the oil industry of the world, were it not for the slow growth of the bush. Mr. M. G. Levy, mine-owner and store-keeper in Ajo, thinks that they will prove of importance as cattle food and that they should be cultivated. Among the frontier population the oil has great reputation as a hair restorer.

On two afternoons we had quite heavy showers, and I felt some regret at having disposed of my large, though inconvenient tent at Indian Oasis, taking with me only the fly. Pablo and I were drenched and so were our blankets. It would have been difficult to make a fire but for the presence of the small resinous bush called *tovoso*, which burned lustily in spite of being dripping wet. We tore the bushes up entire and kept up a bonfire by which we dried ourselves and cooked our food. I began to wonder whether this could truthfully be called a desert.

## UNSOPHISTICATED INDIANS

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ordinary weather the inhabitants of one place can hear <sup>361</sup> the singing of those at the other on festive occasions. The days were warm now, hardly any day registering <sup>[32]</sup> less than 100° F. in the shade, often more. But climatic conditions matter less than the attitude of the people one meets, and here there was an unexpected charm of simplicity and unobtrusive inquisitiveness which reminded me of former happy occasions in my life among natives. A sahuaro feast had been concluded the day before. People from the surrounding country were still <sup>[81]</sup> lingering and my arrival furnished an excuse for an additional delay. Crowds of people, fifty or more, kept around me wherever I went. <sup>[609]</sup>

The Papagoes in the Santa Rosa valley are less <sup>181</sup> spoiled by contact with civilization than in any other <sup>609</sup> part of their country. From my note-book at this time I take the following remarks: "I have never yet met with a cross Papago; they are always amiable. In my quest for specimens they smilingly admit me to their store-rooms to inspect their fine granary baskets and other kinds of baskets and utensils, and allow me to look around inside and outside of the houses as much as I like. On the other hand, they have no tact; they seat themselves unconcernedly in a folding easy chair of mine, or go to the box in which I keep my collections and take out all the things to look at. They are always on hand at meal-times; they dive with delight into the box of crackers set before them, and are very fond of coffee."

They were rather a crude type, but pleasant to deal <sup>000</sup> with, and were continually bringing things for me to buy.

## APPENDIX III

399

author the fossil collections necessary to determine this definitely have not as yet been made. Intrusive granites and porphyries, in general somewhat earlier than the flows, intrude all the earlier formations, and are responsible for most of the ore deposits of the region. 133

Of the many interesting physiographic features of this area, the most striking is the commonly developed knife edge form of the mountains which protrude above, and are partly buried by, the detritus of the valleys. These mountain stumps are always chiselled into precipitous slopes by wind and torrential action. The valley fill is largely subaërial, deposited by the withering torrents from the mountains, which rarely if ever reach the gulf, or brought up by the wind from the present and ancient strands of the gulf, and built into the extensive "médanos" described by Mr. Lumholtz. Only temporary incursions of the gulf up the valleys, in Miocene and later times, are suggested by the fossils collected by Mr. Lumholtz and others, and by the numerous abandoned shore lines of the Salton Sea to the west.

The climate of this region has undoubtedly been dominantly arid during recent geological times (late Tertiary, Quaternary, and Recent Periods), as shown by the physiography of the country, the make-up of the desert fill, etc. Brief respites, however, due to increasing humidity, are suggested by numerous "dry lakes," at times filled with water, and more recent changes by the deserted Indian villages, far from any known surface water supply. 132 ●

[p. 400 is blank]

175 It was the Sobaipuris for whom and by whom the Spanish missions were built. The picturesque and well preserved San Xavier Mission, about nine miles south of Tucson, was built at the largest village, Bac. The others were located at Guvavi, about nine miles north of Nogales, and at Tumacacori, midway between.

Fleeing before the ravaging Apache early in the nineteenth century, the Sobaipuris abandoned their villages and the missions, and took refuge among the Papago, with whom the tribe merged and lost its identity. The last one of the known Sobaipuri braves died in Tucson in March, 1932.<sup>2</sup> The present village at San Xavier was settled by Papago at a later date.

#### ECONOMIC ADJUSTMENTS TO THE LAND

132 Water, or rather its absence, is the critical factor or resource of the  
312 Papaguera; limiting in turn habitable sites where water may be had for domestic purposes; limiting the economically useful vegetation to short lived annuals and low scattered xerophytic perennials suited to limited grazing; severely restricting the tillable lands in spite of extensive areas of flat land with deep fertile soils of the lime accumulating type. The rainfall varies from less than five inches in the west to as much as eighteen inches or more in the Baboquivari Mountains.

241 In recompense, the aridity has afforded a degree of security, for the  
648 area has offered little to hostile marauding Indians, or even to the covetous  
311 white man. Few white families could make a living on as much of this land as may support an entire Papago village. The very poverty of his land has been the Papago's guarantee, and his peaceful record is in large part due to the fact that he has had comparatively little provocation or interference. A high degree of adaptation through centuries of adjustment, combined with a low standard of living, have made it possible for over 5,000 Papago to live on about 5,000 square miles of this region, desertic both in climate and resources.

241 The Papago are the premier dry farmers, producing wheat on driest lands where it is known to be successfully grown, with as little as five inches of rainfall or less.<sup>3</sup> Some years the crop fails entirely, for the rains do not always come. But yields as high as twenty-five bushels to the acre have been grown. A good harvest will furnish wheat enough to last several years, and the Papago have learned the wisdom of keeping a reserve on hand.

<sup>2</sup> The Arizona Republic, March 16, 1932, p. 1.

<sup>3</sup> Carl Sauer and Donald Brand, *Prehistoric Settlements of Sonora*, with Special Reference to Cerros de Trincheras (University of California Publications in Geography, Vol. 5, No. 3, 1931), esp. p. 75.

361 9. *Anegam*, of the upper Santa Rosa and tributary valleys, is the new  
 621 site of the village Omik-vaxia (Salt Well). The latter was located on "the  
 strip" withheld from the reservation in 1917. The Indians were at that  
 time forced to move their village. With the inclusion of "the strip" into the  
 reservation, some return movement may be expected. Copperosity (Chuopo)  
 was the reserve village. Kukomalik was also settled by these people.  
*Anegam* is now one of the largest of all the villages.

10. *Quajote*, on the plain between the Slate and Vekol Mountains, with  
 its reserve village, Bitter Wells, is parent to the villages northward, toward  
 Casa Grande. Some of these people settled at Santan on the Gila River and  
 on the Salt River, and are living among the Pima.

11. *Komalik* is the old Baboquivera Valley village. Its ancient reserve  
 village was Comobabi, Sonora, but nearer reserve villages developed along  
 the Baboquivera Range, the most important of which was Fresnal. They  
 no longer trek to Comobabi, and this village together with Cobabi and the  
 neighboring communities of the piedmont and valleys on the east side of  
 the Sierra de Cobota, Sonora, although of independent origin, have, by  
 virtue of geographical unity, propinquity, and the international boundary,  
 become a distinct unit in Sonora.

221 12. The *Sand Papagos* have been the most nomadic of the Papago  
 361 tribes. They occupy the truly arid region west of the Ajo Mountains.  
 621 Rainfall diminishes toward the Gulf of California, where it averages as  
 little as two and one-half inches a year.<sup>6</sup> The reservation does not extend  
 184 beyond the Ajo Mountains, and there is no need for it, as the region is  
 and must remain virtually uninhabited by whites except for the former  
 copper mining camp at Ajo. The existence of these people depended upon  
 their knowledge of the places in mountains where there are natural water  
 tanks, such as Tinas Altas,<sup>7</sup> the Tule Tanks, and the Papago Tanks. The  
 latter is a small oasis with an abundance of shade, grass, and a little ribbon  
 of flat fertile valley.<sup>8</sup> For food the Sand Papagos ran down jack rabbits in  
 the loose sand, killed mountain sheep, mule deer, and antelope with bows  
 and arrows, and caught muskrats. They ate lizards, and at certain seasons  
 went to the coast to fish and to obtain salt. Only a single agricultural site  
 has been attributed to these people, southeast of Tinajas de Emilia in Pini-

<sup>6</sup> Godfrey Sykes, *Rainfall Investigations in Arizona and Sonora by means of Long Period Rain Gauges* (Geographical Review, April, 1931, pp. 229-33).

<sup>7</sup> Kirk Bryan, *The Papago Country, Arizona: Geologic, and Hydrologic Reconnaissance with a Guide to Desert Watering Places* (U. S. Geological Survey, Water Supply Paper 499, Washington, pp. 132-34).

<sup>8</sup> W. T. Hornaday, *Camp Fires on Desert and Lava* (New York, 1909), pp. 181-82, 235.

## VIKITA CEREMONY OF THE PAPAGO (CONT.)

In the afternoon a white cloth covered framework similar to that carried at Anegam was brought out. This was about ten feet high and four feet wide, with a bilobate top, each lobe the same size, one of which had a smaller lobe at its edge just below the top. The high wind which came up before noon made this an extremely difficult thing to carry, and the dancers, propping it up with sahuaro sticks, were hard put to it to keep it from blowing away. In this period the dancers discarded their bows and arrows, took up the sahuaro fruit gathering poles and held the frame upright by hooking the short sticks at the end of the poles over the top of the frame. A similar framework was brought out a little later, probably the same one carried at Anegam.

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After this a float bearing a blue mountain about 3' long and 18" high appeared. Triangles and semicircles of white paper pasted on light stick frames were fastened upright about and on the sides of the mountain. The choristers carried triangles behind this float.

The last float observed was a hemisphere on a stretcher, some four feet in diameter, solidly tied in with raw white cotton, and with brown zigzags leading from the top centre down the sides. This was almost demolished by the wind before the procession was completed. The choristers carried the wands with the cotton balls on the upper ends during this period.

About ten A.M. an east wind came up, blowing in gusts, and increasing in velocity as the day wore on. The dust blew in dense clouds, along the north and south sides of the enclosure, across the dance floor and directly into the lean-to. How the four young folks there breathed at all was beyond our understanding. The old man was continually wiping their faces, especially their eyes, with his cloth. In the afternoon the dust was so heavy and thick, swirling in stinging blasts, that we could not see the dancers eight feet away from us. A little girl sitting on the front bumper of a car nearby went to sleep and fell off on the ground without waking up. An hour later she was drifted deep in sand, and we were afraid she would suffocate.

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About 11:30 A.M. the chorus entered the enclosure and remained inside, and we were conscious of a renewed interest and vitality in the crowd of patient and dusty spectators.

A dancer ran around to the dance floor and there, with a stick, described a circle on the ground, about 6' in diameter, leaving a narrow opening on the east side. He then returned to the group, waiting on the east side of the enclosure. Then several dancers ran to the dance floor, each carrying a gourd, painted white, with red lines trailing from the rim, each with a stopper of wadded cloth, and very carefully set them upright around the circle, just inside the line, scooping out a hollow in the ground to hold each gourd upright. These men entered the circle on hands and knees, head down, as though crawling

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## VINITA CEREMONY OF THE PAPAGO (CONT.)

at their heels, quite terrifying them.

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Now, the time being twelve noon, the crowd dispersed to its various camps, and ate lunch, and for about an hour no dancers or choristers appeared.

About one P.M. a few dancers straggled out of the enclosure, as if to warm up before the afternoon performance, and by two P.M. the dance was in full swing again. (The wind and dust had increased, and a heavy black cloud was moving up from the southeast, from the direction of Baboquiviri.

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The dance from two until four P.M. employed no new floats or objects other than those noted above, but about 5:30 the young people in the lean-to, with their attendants, disappeared. The crowd began to disperse, and an old Papago told us that rain, for which they had been dancing, was coming soon, that the dance would end before five, and that after the dance, in the evening and night, everyone would get drunk. We left at four, and as we left the crowd of spectators, the dancers were coming out carrying hoes and rakes, the choristers carrying sticks on which were imitation ears of corn. The rain was almost upon us then, dense clouds of dust preceding it and blotting out the entire scene.

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The dust was so heavy in the moments before the rain began that we had to stop our car, unable to see the road, or even houses and corrals within three feet of us. Then the rain started, and in this rain we proceeded homeward.

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177 Soon after his death and the later history, in spite of the picturesque labors of the saintly Garcés, shows no great revival. The Papagos, after a brief Spanish influence, were left to their own devices. They had acquired horses from the Spaniards, and had learned to plant wheat and some imported vegetables and fruits. Their houses gradually changed and adobe dwellings came into use, and as they adopted clothing it was the colorful mantilla and the Spanish cowboy costume which appealed to them. Many had been baptized by Kino and they continued to seek the priests so as to get for their children Spanish names. Except for these changes their old life continued, while the Pimas, whose contact was with the American whites of gold rush days, changed more rapidly. This paper therefore presents a brief account of Papago customs and ethnobiology as reported by the first Spaniards and as seen in the remoter villages at the present day.

132 The Papago country is one of the hottest in the Southwest; the annual rainfall is about five inches and this takes the form of violent storms in the summer, when for a few hours the washes run full. The country is a series of flat valleys between abrupt low ridges or hills, and it is only in the hills that there are springs which give a permanent water supply. Therefore, to get even drinking water the Papagos had to lead a migratory life, although it was a migration within set bounds. In the summer, after the torrential rains, they moved to the flat land to plant their small gardens, and from this base scattered out on food-gathering parties. The women brought in leaves, fruits, seeds, and roots; the boys hunted rabbits and birds, while the men attended to what agriculture was possible. They dug a reservoir which supplied them with drinking and washing water while it lasted, after which the whole village had to move.

221 There was generally a winter camp where all the members went, and this was called the Well, while the summer dwelling was known as the Fields. At the Well every family

241 present irrigation is practiced in the same river valleys where the Spaniards found it, although only one of the irrigated localities falls within the United States Papago Reservations with which the present paper is concerned. This is San Xavier del Bac, outside Tucson. The old residents of this district died out during epidemics and Apache raids, and Papagos from the desert have moved in within the last sixty years to take their places. Through the rest of the area the old Papago settlements plant *de temporal* as formerly. The government wells scattered through the reservation are used for watering stock, and to make it possible for the residents to remain the year around, but they do not affect agriculture.

132 The rainy season in Papaguera is concentrated in July and August, when almost all of the five to eight inches falls. The washes, dry for the rest of the year, are at times filled for a few hours with a torrent of muddy water which sometimes covers the adjoining land to a depth of two or three inches, and it is after the ground has been thus moistened that the Papagos break it up for planting.

132 In the first bulletin of this series (6) reference was  
241 made on authority (22) to the Papago as never having been  
222 an agricultural people, depending entirely upon the wild products of nature for their food supply. A study of the Papago as indicated above has shown however that this needs qualification; they do exploit the vegetable resources of the desert to the utmost, and in years when the rainy season is late live entirely on wild products without planting at all; nevertheless, they have at least at times a rather well developed agriculture. July is known among them as the "Month of Rains" and August as the "Month of Short Planting." If the heavy rains are delayed until August, these people sometimes do not plant at all since the growing season is too short to allow the crops to mature before frost. In this event they change their whole scheme of living; they eat the seed-corn and beans and spend the rest of the summer in food gathering and the winter working wherever employment can be obtained.

important social unit to the extended family which, in some other Rancheria cultures, was the largest effective social unit. Leadership, as among other desert tribes, was more through personal influence and character than vested authority. In addition to the headman each village also had a council of elders, a village orier, a keeper of the smoke, and other village officers who were in charge of ceremonies and festivals. Papago warfare, led by men selected for their ability, was directed principally against the Apache on the east.

Perhaps the people now known as Papagos would be more accurately described as the descendants of three west to east groups whose "Rancheria" type culture became more complex toward the east where increased rainfall and surface water permitted such things as concentrated and permanent settlements, greater division of labor, and more elaborate religious ceremonies. Dr. Bernard Fontana, at any rate, has pointed out that at the time of Spanish contact there were three major "types" of Papago groups classified on the basis of subsistence and settlement patterns. (Personal Communication). These, according to Fontana, were the western centrally-based nomads, the Sand Papagos, living in an area of less than five inches of rainfall annually and located between the Gila Mountains on the west to the Ajo Mountains on the east; the central "akohin" farmers, or Papagos proper, whose winter-summer transhumance

195 pattern is well known, living in an area of between five  
101 and ten inches of rainfall annually and located between  
131 the Ajo Mountains on the west and the Baboquivari Mountains  
● 132 on the east; and the eastern riverine sedentary Papagos, or  
"Sobaipuris", living in an area of between ten and fifteen  
inches of rainfall annually and located between the Babo-  
quivari Mountains on the west and the San Pedro Valley on  
the east.

195 Papago agricultural techniques were simple.  
105 Most fields were small, located at the foot of steep  
241 slopes, where intermittent streams emerged at the edge of  
the flat desert land; at these "mouths" (akohin in Papago),  
a small cultivated area could be watered, if rain came in  
the adjacent hills at the right time. Small irrigation  
channels were used to bring water from larger mountain  
streams to fields in the flat valleys, but no large-scale  
development of irrigation was possible such as the Gila  
[162] and Salt valleys permitted. Along the Santa Cruz River,  
however, in the vicinity of the San Xavier Mission south  
of Tucson, extensive irrigation canals were used in pre-  
Spanish times and, even though smaller in extent than the  
aboriginal irrigation systems along the Gila and Salt, per-  
mitted a concentration of population at Zac which exceeded  
the size of any of the Pima villages farther north. (Dr.  
Bernard Fontana, Personal Communication).

Soils and Minerals. The greatest portion of the Papago Reservation is composed of alluvium weathered from the scattered hills and mountains, and which grades from coarse to fine as distance increases from the source. In the valley floors the soil varies from fine sand to sandy clay and clay, all suitable for agriculture where water is available. 134

Although in the latter part of the nineteenth century mining brought large numbers of people to the Papago country and several sizable settlements flourished for brief periods, mineral resources have not yet been discovered which would be suitable for large-scale, long-term development. No oil or gas has been found, and promising formations are absent. Highly mineralized formations, mainly Pre-Cambrian and Mesozoic, have produced limited amounts of gold, silver, lead and manganese. Workable copper deposits exist close to and on the San Xavier Reservation, and are being mined on a large scale. 135

Climate. The Sonoran Desert, in which the Papago country lies, is part of a series of deserts occupying about 440,000 square miles in the southwestern U. S. and northwestern Mexico. It is desert in both the colloquial and technical senses, with potential evaporation 8 to 10 times greater than rainfall. Although long records of rainfall, temperature, and other details of weather are scanty for the Papago Reservation, recent records can be used in conjunction 137  
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[127] with data from nearby areas such as Tucson and Ajo to provide a sufficiently accurate picture for this report (see Map 2.) The highest precipitation is in the Baboquivari Mountains, where the annual average is about 20 inches at high elevations. A few miles to the west, at lower elevations, the annual average is only 12 to 14 inches, and as one goes toward the west and north the trend is steadily drier, with average rainfall of 10 inches or less at the west edge of the reservation and less than 7 inches at the extreme north. Fully as important as the general scarcity of precipitation is the nature of its occurrence--divided between a summer season of scattered, intense storms from July to mid-September, and a winter season of gentler, more widespread rains from early December to early March. The annual total varies tremendously for any locality, so that averages mean little to anyone depending on rainfall during any given year for farming and stock raising. At Ajo, about 10 miles beyond the western edge of the reservation, records have been kept since 1914. For every month but July and August a monthly total of zero inches has been recorded at least once, and even July and August have had monthly totals as low as 0.04 and 0.20 inches respectively.

Although temperature and humidity are less crucial components of the climate than is precipitation, the long, hot season prior to the summer rains, the characteristically low humidity throughout the year, and the wide daily range in temperature are significant factors in the environment.

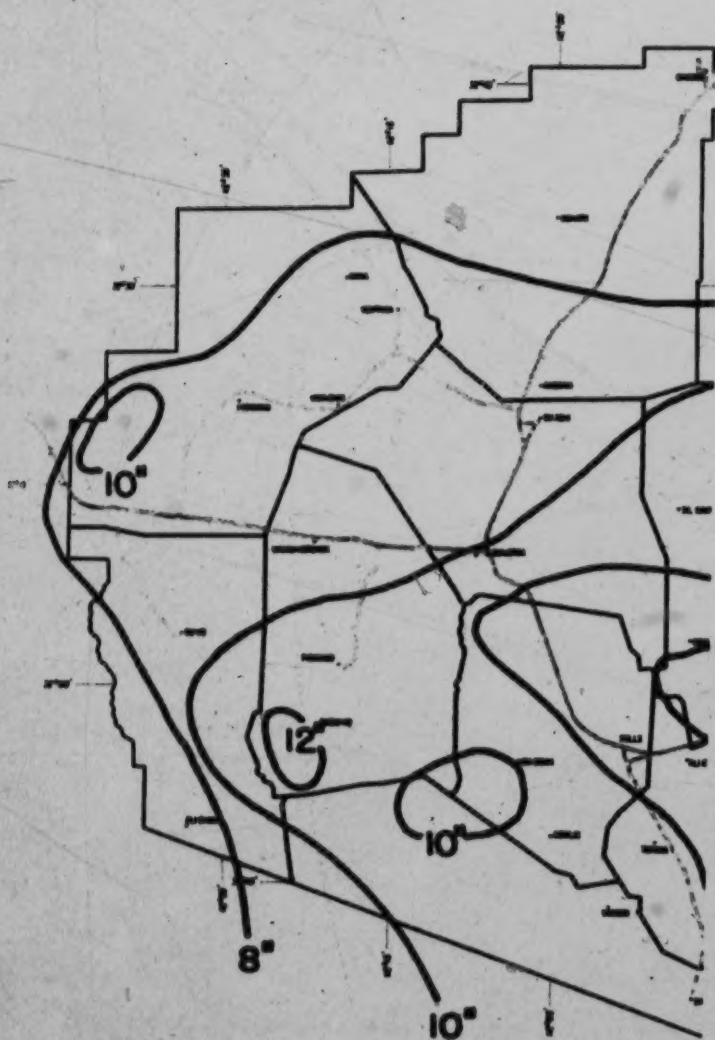
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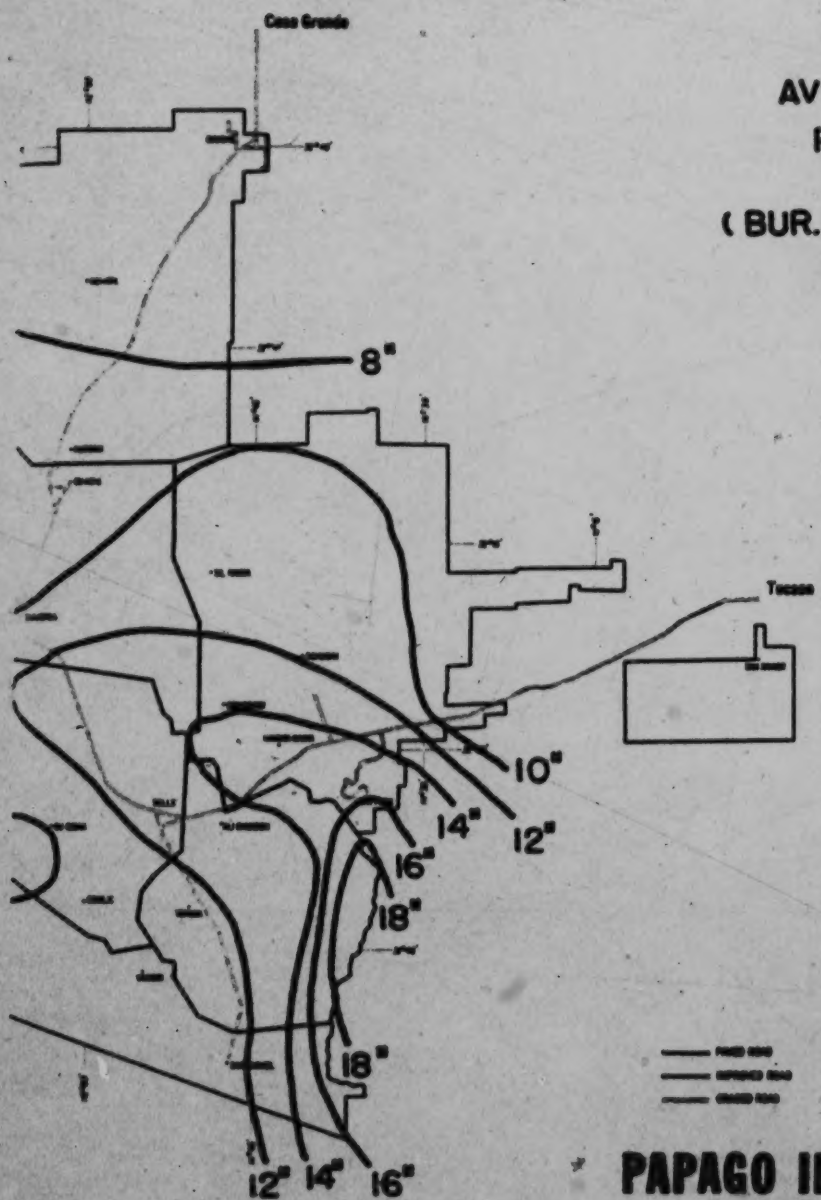
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NU28 Papago NU28.

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[p.20-A1]

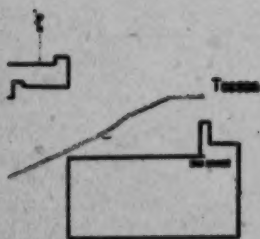
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[P.20-A2]

## MAP 2

AVERAGE ANNUAL  
PRECIPITATION

( BUR. LAND OPER. RECORDS )



——— ROAD  
——— RAILROAD  
——— CANAL

**PAPAGO INDIAN RESERVATION**

1993

[A20-A3]

With unimportant exceptions at the highest elevations, the average daily temperature (maximum plus minimum divided by two) in July is about 90° F. and in January about 50° F. In the winter, temperatures sometimes go below freezing, as clear nights result in intense radiation. The growing season, however, between the last spring frost and the first fall frost, ranges from 250 to 300 days. Since the first fall frost comes late (at Ajo, December 16; at Tucson, November 19), there is generally a period of 100 days or more after the start of summer rains in July before crops might be damaged by the cold.

Table 1. Temperature and Growing Season at Selected Locations On and Near the Papago Reservation

| <u>Location</u> | <u>(Degrees F)</u><br><u>Temperature</u> |             | <u>Killing Frosts</u> |             | <u>Growing Season</u> |
|-----------------|------------------------------------------|-------------|-----------------------|-------------|-----------------------|
|                 | <u>Max.</u>                              | <u>Min.</u> | <u>Spring</u>         | <u>Fall</u> |                       |
| Presnal School  | 113                                      | 13          | Mar. 16               | Nov. 21     | 250 days              |
| Tucson          | 111                                      | 6           | Mar. 19               | Nov. 19     | 245 days              |
| Ajo             | 115                                      | 17          | Jan. 27               | Dec. 16     | 323 days              |
| Casa Grande     | 122                                      | 17          | Mar. 19               | Nov. 19     | 255 days              |
| Gila Bend       | 123                                      | 11          | Feb. 16               | Nov. 30     | 287 days              |

(From "Soil Conservation Program, 20-Year Period, Papago Agency, Sells, Arizona, 1954", File 344.11, Papago Agency, Office of Land Operations, Sells.)

was variously estimated at from 30,000 to 50,000 of the former and 8,000 to 10,000 of the latter. It is possible that the number of cattle sold annually from the reservation influenced Clotts in arriving at these latter estimates. As Gwyneth Harrington learned later, Papago have always been credited with running more cattle than they possessed because of the numbers sold from the reservation. She learned that Mexican cattle were habitually introduced into the United States through the Papago Reservation at market time by Mexican ranchers seeking higher prices for their stock.

Clotts' comments on stock raising as observed in 1914 are of sufficient interest to quote in full (Clotts, 1915, pp. 7-8):

"Husbandry. These Indians own at the present time a very large number of cattle and horses. These are ranged in the valleys as long as the water lasts in the charcos, and are then driven to the mountains and watered at the wells, the water being raised by means of the simple combination of saddle pony, lariat, and rawhide bucket. The Indians are good horsemen and round up and branding time is an important event.

"Grazing. A large number of cattle are sold annually to buyers from Tucson and other points. It is a fairly good cattle country, notwithstanding the lack of a sufficient number of watering places scattered throughout the country. It is variously estimated that there are from 30,000 to 50,000 cattle and 8,000 to 10,000 horses belonging to the Papagos. Among these is a good proportion of very good stock since the introduction a few years ago of a number of thoroughbreds.

"Owing to the hot, dry months of May, June, and sometimes July, when the charcos go dry and the grazing around the mountain wells is reduced to

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[461] flooding and grasshoppers is won. This subsistence scale, risky enterprise cannot long compete against the surplus-over-subsistence earned in the cotton fields.

The crops Desert People working in the 1950 cotton harvest did plant on the reserves were not even on a subsistence scale. The few beans or squash, the patch of melons they actually planted were no more than a supplement at most.

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423 Clearly an important reason Papagos sell their labor is that a high proportion do not even have flood farms where they could try to farm if they wished to. Probably nearly half the Desert People picking cotton in 1950 had no fields.

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[32] For Papagos who cannot farm, there is still a possibility of raising cattle. However, xerophytic desert vegetation is not particularly well suited to fattening cattle--thorns don't make fat. Rainfall on reserve lands is very scanty, and good stands of grass are small and undependable.

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422 Among Papago cotton pickers of 1950, nearly half the families owned cattle. However, some of them actually had only 1 cow, and the average number of head owned by each family was only a dozen.

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[646] One difficulty for Papago cattlemen is that horses are kept by most families, taking up range that could support more beef animals. These horses are not especially good stock--no one raises horses for export. But the Desert People are still mainly in the pre-automotive age of transportation. If they don't walk, they generally must ride horseback or in a wagon pulled by horses. Over three-fourths of Papago cotton pickers in 1950 owned horses. And each of these families kept 6 or 7 horses. If it were not for an ordinance of the Papago Tribal Council restricting each family to not more than 10 head of horses, horse population of the reserved lands would undoubtedly be much higher.

139 families gave information. 80 had their own fields, or 61%. (Only 2 were in irrigated projects, 5%) Fathers of 3 younger men had flood fields, 8%. So 41% had no flood fields in their extended family.  
519 families of 40 questions owned cattle, 47%.  
36 families giving information owned 96 head, averaging 12 per family.  
431 families of 40 questioned owned horses, 77%.  
521 families giving data owned 136, averaging 6.6 each.

**PHYSICAL CHARACTERISTICS OF THE REGION.**—The territory covered by the Papagos in their migrations, and in which their villages are located, consists of mountain ranges and the intervening valleys. The soil of the valleys contains a considerable proportion of clay, so that it is all called adobe soil. In the mesas or plains occasional strips of sand occur. Along the arroyos, or dry water channels, deposits of gravel are numerous. The arroyos become raging torrents during the rainy season, rendering travel impossible or dangerous during the temporary flood. The soil of the foothills is very rocky. Alkali is present in the soil in varying proportions, giving the characteristic name to the vast stretch of country known as the alkali desert. It is not the presence of alkali, however, that makes the desert, but the absence of water. An abundant water supply renders this alkali soil equal in fertility to any soil in the country. As it is, the valleys contain a great deal of arable land, which is evident from the great areas covered with grass, which form the stock ranges, and from occasional sections where weeds grow so luxuriantly after the rainy season as to overtop a man on horseback. Some portions of the valleys are covered with mesquite trees and bushes, and also agavebrush, but these sections produce abundant crops when irrigated.

**CLIMATE.**—The climate is very mild, being neither extremely cold in winter nor hot in summer. The mean average temperature during the summer of 1899 was 81.3°, and during the winter of 1899-1900 it was 52.6°.

**WATER SUPPLY.**—There are occasional wells found among the Indian villages. Natural water holes are quite numerous, and by raising embankments of earth in favorable localities the Papagos make large ponds or reservoirs, which they call tanks. These natural and artificial reservoirs are only serviceable for the temporary storage of water, and toward the last they become filthy mudholes. The Indians, however, continue to use the water as long as it can possibly be considered a fluid. In one place the Papagos have dug a well 80 feet deep, and with incredible labor have made a footpath from the top of the ground to the level of the water.

Water is found by boring at a depth of from 200 to 600 feet, but no flowing wells have yet been obtained in the territory. The water in the wells rises from 50 to 150 feet, and then is raised to the surface by steam pumps. The Indians, however, have not the financial resources with which to sink or operate artesian wells. When their tanks are exhausted they remove with droves and herds to the valleys and oases in the mountains, frequently crossing over into Mexico.

**TIMBER.**—The varieties of timber within the Papago range are the willow, cottonwood, mesquite, pollewerda, and on the southern and western mountain slopes the oak. The mesquite is the most common timber, as it grows freely on the mesas. It rivals the hickory as firewood, throwing out great heat, and the coals retain fire even longer than coals of hickory. The mesquite, however, is very easy to cut, and is handled with far less labor than hickory.

**FRUITS AND NUTS.**—The *salsuero* (giant cactus), which grows on the rocky soil of the foothills and covers the moderate mountain ranges, rises in height from 10 to 60 feet, and is a mass of vegetable matter, supported by an internal skeleton of ribs or poles of woody fiber. The fruit of this remarkable plant grows out of the top of the trunk and arms, and constitutes an important article of food, the Papagos almost living upon it during June, July, and a part of August. They gather it with long poles, and eat it either fresh or after it has been dried. They make from the juice a sirup and a drink which is slightly charged with alcohol. Although the ribs of the *salsuero* are very valuable, the Indians never destroy the plant, and are greatly incensed if a white man cuts one down; but when the cactus dies and the vegetable matter dries, powders, and falls away, leaving the ribs exposed and bare, they are used as supports for the dirt roofs of adobe houses, for the sides of houses when plastered with mud, for poultry and pigeon houses, and other small structures.

The Papagos eat the fruit of the prickly pear cactus and make a sirup from its juice; from the mescal (sweet aloe) a highly intoxicating drink is made. The root, which is bulbous, grows partly under and partly above the ground, and when roasted it is very delicious, and great quantities are consumed by the Papagos. They dig out of the ground a vegetable which appears to be a species of wild onion, but they call it a groundnut, and relish it highly when boiled. A very useful plant found in large quantities, called the soap plant (*sapo*), forms a substitute for soap.

The tannin root, resembling the sweet potato in appearance, grows in great profusion. It contains a large portion of tannic acid, and is a substitute for the astringent bark, hemlock and oak, which are used in tanneries.

**FOOD.**—In addition to the fruits, nuts, and fish already mentioned, their food consists of wheat flour (usually formed by the women on a *mestle*) prepared in simple ways, parched wheat and corn, boiled wheat and corn, flour made from the mesquite bean, beans, boiled squash, green and dried squash seeds, beef, and poultry.

**INDUSTRY.**—The Papagos seem to be esteemed by the whites in general as the best Indians in the territory. They are industrious, and are good help in mines, on ranches, in the harvest field, and on stock ranges. They easily learn the mechanical arts, and set and handle mining drills as well as white men. The engineer at the Quijotea mine said that his assistant was a Papago, and that he was fully competent to run the engine.

In practical irrigation the Indians are conceded to be the superiors of the whites, and in their domain this is the foundation of agricultural skill. When properly educated there can be no doubt of their ability to acquire the scientific principles of the art.